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16th Annual Program Gulf Coast Citrus Institute

The Reduction of Rind Breakdown of Marsh Grapefruit By Polyethylene Emulsion Treatments

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Miss Sandy Guthrie of Miami
1961 Florida Citrus Queen

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A VIEW OF OUR BABSON PARK NURSERY

SPEAKING OF HIGH PRICES---

In these days of high prices, citrus growers, like everyone else, must stop and think twice when they are contemplating a purchase. Land prices and labor costs are up. Most other costs seem to be following an upward spiral. The question to consider, it seems to us, is not the price today, but the value received tomorrow and thereafter.

We would say that when a man is planting a citrus grove, the nursery stock he buys will be the cheapest part of his investment in the long run. And, by the same token, it can be the most expensive part, if that grower is willing to sacrifice quality tomorrow for apparent low prices today. High priced land and high priced costs of land preparation and grove care later on cannot be combined with poor quality nursery stock to make a high quality bearing grove in the future.

After all, you can be sure of one thing. Every man knows the quality of his own product and sets his prices accordingly. You will always be able to find someone who is willing to sell his product cheaper than the next man.

BUDWOOD SELECTION AND QUALITY
OUR MOTTO SINCE 1915

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THE FORWARD LOOK

. . . BY . . .
FRANK D. ARN
Director of Advertising
and Merchandising
FLORIDA CITRUS COMMISSION
at the
INDIAN RIVER CITRUS SEMINAR
Cocoa, Florida
January 12, 1961

After experiencing freezes and hurricanes, here's a Florida citrus man's "Heavenly Reward":

"He walked up to the heavenly gates,
His face was scarred and old;
He stood before the man of fate
For admission to the fold.

'What have you done,' Saint Peter asked
'To gain admission here?'
'I worked for the Florida Citrus Industry, Sir,
For many, many a year.'

"The pearly gates swung open wide
When Saint Peter touched the bell.
'Come in and choose your harp,' he said,
'You've had your share of hell'."

As we look back over the past few decades, I am sure there are many of you here today who can remember your first automobile ride, or listening to the radio for the first time, and viewing that four-inch screen television set. The commercial airlines, too, in recent years have made great forward steps, and now are in the new jet age. Here in our own backyard we are seeing great forward strides being made in the space age. Almost every day new and improved rockets are shot into orbit at Cape Canaveral.

Yes, gentlemen, during the past few years we have lived through the most progressive scientific development stages this country has ever known.

When we speak of developments, we in the citrus industry are vitally concerned with the new era in the food retail world, as here is where our products are channeled for distribution. Far be it from the old barrel cracker and hoop cheese days, we are living in an age of modern food distribution where it is the election by selection functioning in a merchandising democracy.

We have all gone through many great elections (and one only recently) where the decision by ballot counts. It is the ballot rule that decides the fate, not only of the office seeker, bond issue, or new law, but also the type of rule that decides the fate of any particular food product.

Can we put it another way . . . It is the right of free men and women to purchase what they please, where they please. Better still . . . It is the right of the customer, when coming into a store, to vote what he or she likes or dislikes.

We must always remember: the customer is the boss who determines which business shall continue to grow and become stronger, which shall struggle for existence, and which shall utterly fail.

Today merchandising can be as pleasant as a beautiful bed of roses — except we must be alert to being pricked by a few thorns, which we know as competition.

When I started in the chain store business 30 years ago, we had slightly less than 1,000 different food items on the shelf; toady in the modern super market you will find six to seven thousand different items competing against each other. From our own standpoint, included in this array of competition are bottled beverages, canned fruit and vegetable juices, synthetic and powdered drinks.

I am not alarmed about this competion. Rather, I view the inroads of new competitors as the symptoms of great changes and now a vital part in the food business throughout the world. I view these changes as a ringing challenge to the foresight and ingenuity of all of us in the Florida citrus industry. I see these new changes as the "Incandescent Light of Progress."

Not long ago, Richard Cardinal Cushing of Boston said: "Our generation has produced things far beyond the dreams and imaginations of our forefathers . . . we should remember that all of this power must be measured beside the potent possibilities of a single idea;" and he added, "the significant battles of tomorrow will be fought in the empires of the mind."

I am sure many of you have heard top business leaders and scientists make expressions in conference rooms, corridors, and even in rest rooms, why a certain program or project would not succeed, even before it was tried. It is fearful to think of the vast number of projects that must have died in the quick-sand of time, just because someone made expressions like these:

1. "It isn't in the budget."
2. "It won't work in our organization".
3. "We tried that before."
4. "We don't have the time."
5. "We're too small an organization."
6. "We've never done it before."
7. "You're years ahead of your time."
8. "That's not our problem."
9. "The Board of Directors would never go for it."
10. "Let's shelve it for the time being."
11. "Has anyone else tried it?"
12. Last, but not least . . . "Let's form a committee."

I would put all of these epitaphs under the banner, "How to Kill Progress."

Remember: "The only thing you can get under a large wet blanket is a large wet chill."

The purpose of this summary is to seek new and better scientific ways to grow and produce fresh Florida citrus products. Our industry certainly has come a long way, but we still have new and unchartered paths ahead. In the early days of our country, there were those pioneers who left the Eastern Seaboard cities to push farther and farther West. But one day they reached the Pacific Ocean and some of the weaker souls among them complained, "The day of the pioneer is over; there is no place to go."

We, too, are merchandising pioneers who have reached new frontiers, and some may say there's no place to go. But there will always be those among us who have the richest gift that Nature ever gave man — the gift of the sense of adventure. It is that gift that makes today exciting, and gives to our great industry the forward look. It is the gift that enables us, when confronted with an obstacle, to let our mind take wings and seek new and unchartered paths.

In closing, I would like to give you one of my favorite quotations from Edgar Guest:

"The things that haven't been done before
Are the tasks worth while today;
Are you one of the flock that follows, or
Are you one that shall lead the way?

Are you one of the timid souls that quail
At the jeers of a doubting crew?
Or dare you, whether you win or fail
Strike out for a goal that's new?"

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The Reduced Status Of Purple Scale As A Citrus Pest...

. . . BY . . .

WILLIAM A. SIMANTON

UNIVERSITY OF FLORIDA, CITRUS EXPERIMENT STATION, LAKE ALFRED

Purple scale **Lepidosaphes beckii** (Newm.) has been an important pest of citrus in most of the citrus producing areas of the world (1). According to Quayle (2) it entered Florida from Bermuda in 1857 and found a favorable environment in the humid Florida climate. In 1918, Watson (3) listed purple scale as the most important scale on citrus and second only to whitefly as a citrus pest. As late as 1957, Griffiths and Thompson (4) stated: "Purple scale causes more economic damage to citrus trees throughout Florida than any other one pest. It is present throughout the state and it is a rare grove where purple scales do not pose a problem at some time during the year."

Citrus growers are well aware of the losses the species can cause due to dropped leaves and fruit, dead twigs, and green spots on the ripened fruit. A substantial portion of production cost can be attributed to efforts to prevent or alleviate this damage.

Several parasitic insects and diseases and a number of insect and mite predators were listed by Muma in 1955 (5) as factors in the natural control of purple scale. Although all of these effected some reduction of scale at times, Muma stated that natural control of purple scale in Florida was inadequate by comparison with chemical control. To keep scale populations below economic levels, growers have had to ignore natural control and have applied one or two scalicide sprays each year.

Weather factors also influence directly or indirectly the abundance of purple scale, but survey records for eight years have not shown any weather condition that exerted a marked suppressing effect for longer than two months.

The discovery of a new parasite **Aphytis lepidosaphes** Compere in June, 1958, and its rapid establishment in purple scale infestations throughout Florida (6), indicated a new biological control factor of importance. This parasite, a tiny yellow chalcid wasp, was imported from Asia into California in 1950. It apparently entered Florida and became widespread without man's help. **A. lepidosaphes** became increasingly prevalent during the latter half of 1958, and by December of that year the purple scale population began to show a definite decline. The purpose of this paper is to report the current status of purple scale and to comment on the outlook for continued effective natural control.

METHODS

The data used for this study were taken from 130 citrus groves throughout the state, selected to be representative of commercial plantings and practices. For each of these survey groves, 250 leaves were examined each month by trained observers and the percentage infested by purple scale recorded. In addition monthly microscopic examinations of 60-leaf samples from 24 of the groves were made to determine the number and identity of healthy and parasitized scales. A complete history of pesticide applications also was obtained for every grove. The records for most of the 130 groves have been comparable and continuous since 1950.

PRESENTATION AND DISCUSSION OF DATA

Statewide Abundance of Purple Scale Before and After December 1958 in Survey Groves.

The abundance of purple scale throughout the state is illustrated by Figure 1, which is based on survey

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1 Florida Agricultural Experiment Station Journal Series No. 1160.

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data from 130 groves for the past nine years. From 1951 through 1958, purple scale populations followed a regular seasonal cycle each year. Although the magnitude of the population varied slightly each year, destructive levels of abundance always were present except in the month of September. In 1959, purple scale population dropped remarkably and became more or less stable at a new low level after June of that year.

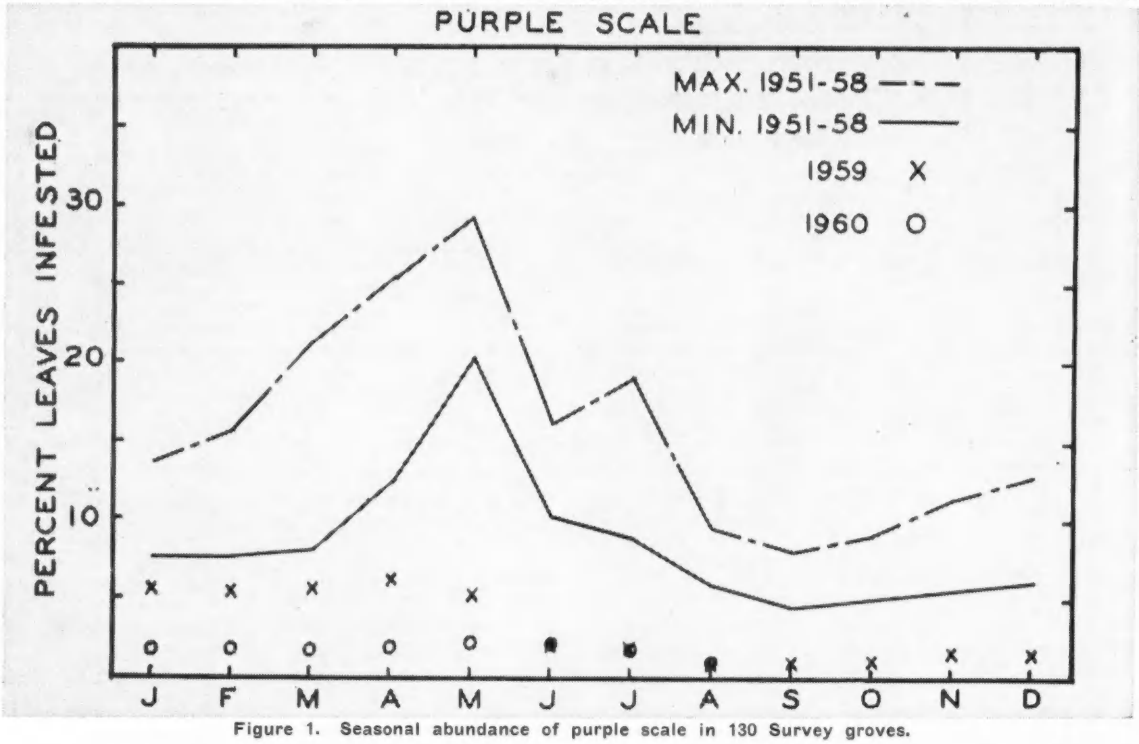

Figure 1. Seasonal abundance of purple scale in 130 Survey groves.

Survey data have shown that purple scale infestations in 1957 were typical of infestations in the years prior to occurrence of **A. lepidosaphes** in 1958; hence, a comparison of 1957 data with 1959 data, years with similar climatic influences, can serve to point out the pronounced change that occurred within a few months time. Table 1 shows the reduction in infestation, using data from all survey groves, the majority of which were regularly sprayed. The figures reveal that although purple scale infestations continue to be widespread, populations generally have dropped so low that few infestations are now of economic importance.

Table 2 presents data taken from seven unsprayed survey groves at widely separated locations. In these groves counts were made of healthy scales and also of scales attacked by two fungi, **Hirsutella besseyi** Fisher and **Myiophagus** sp. Thaxter, and the second stage insect parasites, mainly **Aspidiotiphagus lounsburyi** (B & P) and **A. citrinus** (Craw). No third stage insect parasite worthy of record was present in 1957, but as Table 2 illustrates, **Aphytis lepidosaphes** which preferentially attacks third stage females, was the most prevalent parasite in 1959. Although its effect far surpassed the reduction of scale caused by the other parasites, the latter also were present in 1959 and took a minor toll of the scale population despite a low density of the host. Since no insecticides were applied to the seven groves and because the effect of other parasites is shown to be minor, the evidence points to **A. lepidosaphes** as the organism responsible for the marked reduction in purple scale.

Effect of Spray Chemicals on Natural Control of Purple Scale by Aphytis lepidosaphes.

Reference to Tables 1 and 2 discloses that the percent of leaves infested by purple scale in 1959 was less in unsprayed groves than in the group with regularly sprayed groves. This suggested that certain spray materials may be antagonistic to **Aphytis**; a factor to be considered if the grower is to obtain maximum

(Continued on next page)

Table 1. Purple Scale Infestations in 130 Survey Groves Before (1957) and After (1959-60) Establishment of **Aphytis lepidosaphes**.

	1957	1959	1960 (To Sept.)
Average percent of groves infested	93.2	73.2	72.8
Average percent of groves with economic infestations	37.6	8.7	2.8
Average percent of leaves infetsed	10.8	2.9	1.8

Table 2. Purple Scale Infestation and Abundance of Purple Scale Parasites in 1957 and 1959 in Seven Unsprayed Citrus Groves.

	1957	1959
Average percent of leaves infested	10.4	1.3
Average number of healthy scales per 100 leaves	31	6.1
Average number of parasitized scales per 100 healthy scales, attributed to:		
Myiophagus fungus on 2nd and 3rd stage	1.4	3.9
Hirsutella fungus on 1st stage scales	5.3	7.2
2nd stage insect parasites	3.5	4.9
3rd stage insect parasites	0	169.0

THE REDUCED STATUS OF PURPLE SCALE AS A CITRUS PEST

(Continued from preceding page)

benefit from this valuable no-cost ally.

To obtain information on this point, data were taken from 22 widely distributed survey groves where monthly counts of purple scale and of purple scale parasites were made. These groves had received a total of 97 commercial spray applications between January, 1959 and August, 1960. Since the date of each spray was known, it was possible to compare pre-spray counts with post-spray counts and evaluate the effect of each application on purple scale and on **Aphytis**. The effect was deemed "poor" if the scale population increased within two months following treatment and if the parasite was initially reduced and did not subsequently overtake the scale. A "good" effect was a reduction of scale to a very low level for at least two months, without proportional destruction of **Aphytis** or impairment of the ability of the parasite population to keep the scale population low. A majority of the treatments fell into a category termed "no effect." This classification was used where purple scale infestation was low both before and after treatments or where evidence of good or poor effect was too meager to permit evaluation.

A tabulation of the pesticides making up the 97 spray applications according to their overall effect on the purple scale-parasite complex, is presented in Table 3. Nearly all of the sprays were combinations of insecticides, and often included fungicides and nutritionals. Except in a few cases to be discussed later, it was impossible to isolate the individual effect of each ingredient; hence, if a spray had a poor effect all components were listed in the poor column. It was postulated that if a chemical was associated with poor effect sprays more often than with good effect sprays, the chemical would be suspect.

Table 3. Classification of Spray Materials Applied to 22 Survey Groves in 1959 and 1960 According to Effect on Purple Scale Control by **Aphytis**.

Material	Total Applications	Number of applications with No Effect	Good Effect	Poor Effect
Oil	35	13	20	2
Parathion	14	4	10	0
Zineb	44	19	22	3
Sulfur	40	23	6	11
Chlorobenzilate	5	3	2	0
Trithion	5	4	1	0
Kelthane	4	3	1	0
Delnav	2	1	1	0
Ovex	1	1	0	0
DN	5	2	1	2
Tedion	1	1	0	0
Copper	35	24	9	2
Zinc	23	15	5	3
Manganese	10	4	3	3
Boron	7	4	2	1
Arsenic	8	6	1	1
Urea	2	1	1	0
Captan	1	1	0	0
Ferbam	2	2	0	0
Molybdenum	1	0	1	0

In Table 3, only sulfur and DN appear more frequently in the poor effect column than in the good effect column. Reference to the spray data revealed that 5 of the 28 poor effect treatments were sulfur alone and 19, including two of the DN applications, were combinations with sulfur. Thus, of the most frequently used pesticides, only sulfur in its various forms, including lime-sulfur, appeared to increase purple scale. When sulfur was used with the scalicide, parathion, however, the net effect was that of aiding scale control.

Of the most commonly used scalicide sprays examined for effect, 18 were oil-zineb combinations, 8 were oil-zineb-copper combinations, and 14 were parathion combinations, 5 of which were with oil.

As Table 3 discloses, none of the pesticides inhibited purple scale control a majority of the times it was used. Most applications of each material either showed no effect or a good one. Sulfur for example, did not always reduce abundance of **Aphytis** but it killed few if any scale. The net result was that of tipping the balance in favor of scale increase in a substantial number of cases. Parathion sprays often reduced the **Aphytis** count to zero, but usually these same sprays also reduced the scale count to zero. **Aphytis**, with a life cycle of about two weeks, apparently was able to build up more rapidly than purple scale, which has a cycle exceeding 8 weeks; hence, the net effect of parathion sprays was to reduce the scale population.

Oil and zineb, the combination most commonly applied, appeared to have little effect on the parasite and tipped the balance in favor of scale decrease except in two cases where oil failed to give good immediate scale control. Some of the other materials listed may have an antagonistic action on the scale-parasite complex, but if so that conclusion could not be drawn from the limited number of applications studied.

Further information on pesticides that may inhibit effective biological control of purple scale by **Aphytis**, was obtained by another method. This involved examination of the spray history of all groves which developed moderate to heavy purple scale infestations at any time during the period from August, 1959 through July, 1960. Only 7 of the 130 survey groves were in this category. Approximately 400 spray applications were made to the 130 groves during this period but only 15 sprays were followed by infestation of more than 12 percent of the leaves. Table 4 lists the 7 groves, the composition of the 15 sprays and highest infestation that occurred following their use. It is obvious that sulfur, especially the combination with lime sulfur, was conducive to purple scale increase. Frequent use of sulfur tended to promote build-up of scale as indicated by the high populations attained in Groves 1 and 4. The one spray listed in Table 4 that did not contain sulfur resulted in only moderate increase and can not be considered suspect in view of evidence previously presented in

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THE REDUCED STATUS OF PURPLE SCALE AS A CITRUS PEST

(Continued from Page 7)

Table 3. The conclusion reached from the above investigation is that sulfur should not be applied to citrus groves in excessive dosages or at frequent intervals. Where repeated sulfur applications are to be used, a scalicide should be included or alternated in the program.

Effect of Weather on Natural Control of Purple Scale by Aphytis Lepidosaphes

The influence of weather is another aspect to be considered in an evaluation of the continuing effectiveness of **Aphytis**. It is known that cold weather retards development of purple scale and presumably also retards its parasites. Prior to 1958, the fungus **Myiophagus** was the principal parasite causing noteworthy destruction of purple scale. It was favored by warm, wet weather but only if a high population of scales was present. Low scale populations since 1958 have caused **Myiophagus** attack to be minor, regardless of weather.

The advent of **Aphytis** as the major factor in purple scale control prompted a study to determine if weather conditions influence the ability of this species to cope with purple scale. Monthly data from 7 unsprayed survey groves for the period June, 1959 through August, 1960, were used for this study. During that period, average temperature was consistently below normal from mid-January to mid-March 1960; June, 1959 and March, 1960 were abnormally wet; and July-August, 1959 and May-June, 1960 were abnormally dry. In no month did average purple scale population exceed the low level of 6 healthy adult scales per 100 leaves. Parasitized scales per 100 leaves varied from 3.3 to 8.7. Scales containing active forms of **Aphytis** numbered in excess of 18 per 100 healthy scales each month, and in one month were as high as 183 per 100 healthy scales. These figures demonstrate that **Aphytis** was active during each of the 15 months and present in sufficient numbers to hold purple scale at low level regardless of weather fluctuations. This finding is further confirmed by Figure 1 which shows that statewide populations of purple scale maintained a relatively constant low level from June, 1959 through August, 1960. In view of the foregoing evidence, it may be assumed that weather fluctuations likely to be encountered in the Florida citrus belt will not greatly reduce the beneficial performance of **Aphytis lepidosaphes**.

Table 4. Composition of All Spray Treatments Which Were Followed by Purple Scale Infestations on More Than 12 Percent of Leaves. Data from 130 Groves from August, 1959 through July, 1960.

Grove No.	Location by County	Date Sprayed	% leaves infested	Composition of Spray
1	Brevard	8-23-59	16.4	Wettable sulfur, lime sulfur
1		10-20-59	28.4	Wettable sulfur, lime sulfur
1		1-28-60	31.6	Sulfur dust
1		5- 2-60	35.6	Wettable sulfur, zinc
2	Lake	11-25-59	16.4	Wettable sulfur, Kelthane, zineb
2		4- 8-60	15.6	Wettable sulfur, zineb, copper
3	Lake	8-26-59	17.6	Sulfur dust
4	Highlands	4- 6-60	18.4	Wettable sulfur, lime sulfur, chlorobenzilate, copper a
4		5-18-60	26.8	Wettable sulfur, lime sulfur
5	Highlands	12-10-59	22.8	Wettable sulfur, lime sulfur
5		2- 1-60	22.8	Wettable sulfur, lime sulfur
5		3-21-60	25.6	Wettable sulfur, copper
5		5- 5-60	62.0	Wettable sulfur, lime sulfur
6	Polk	6-19-59	13.2	Oil, parathion, copper, zinc
7	Polk	5-11-60	14.0	Wettable sulfur, lime sulfur, zinc, manganese

a Wettable sulfur, lime sulfur followed by chlorobenzilate and copper 18 days later.

SUMMARY

Purple scale, a consistently important and widely distributed pest of Florida citrus for many years, has usually required one or two sprays each year for control. Prior to 1959, natural control factors were inadequate to hold populations below economic levels. This situation began to change markedly in 1958 when a new parasite, **Aphytis lepidosaphes** Compere, appeared in purple scale infestations. Establishment of the parasite throughout the citrus belt decimated the purple scale population in 1959, and shows promise of holding purple scale at non-economic level in the future. During the year from August, 1959 to August, 1960, only 7 of 130 survey groves developed noteworthy scale infestations, most of which declined rapidly except where repeated or excessive sulfur applications were made. A study of 97 spray treatments in 22 groves disclosed that of commonly used pesticides, only sulfur inhibited effective control of purple scale by **Aphytis**; hence, excessive sulfur applications should be avoided. Weather fluctuations appeared to have little effect on the ability of this outstanding new parasite to check purple scale.

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ELOISE GROVES ASSN. HOLDS ANNUAL MEETING AT BROOKSVILLE, MAR. 7

The annual meeting of Eloise Groves Association was held in Brooksville on Tuesday, March 7th. John A. Snively, Jr., reported that the boxes of fruit in the association had increased from 2,200,000 to 2,700,000 for this year.

The new Board of Directors composed of B. C. Cook, John C. Fosgate, R. D. Flippo, John A. Snively, Jr., T. V. Snively, Jr., John A. Snively, III, Winston Lawless, Jack G. Endsley, J. B. Mountain, T. V. Snively and H. E. Smith was elected in a Board of Director's meeting following the stockholder's meeting.

John A. Snively, Jr. was elected president, T. V. Snively, Jr., vice president, J. T. Griffiths, secretary-General manager, Carl F. Williams, treasurer, and J. K. Enzor, Jr., assistant general manager.

The stockholders enjoyed a luncheon served by the Woman's Auxiliary of the American Legion at Brooksville. This was followed by a tour of the concentrate and chilled juice facilities of Dairy Service Corporation.

The Reduction Of Rind Breakdown Of Marsh Grapefruit By Polyethylene Emulsion Treatments

. . . BY . . .

PAUL L. DAVIS AND
PAUL L. HARDING

U. S. DEPT. OF AGRICULTURE
ORLANDO, FLORIDA

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Introduction

Pitting, a form of rind breakdown of oranges and grapefruit in storage, occurs frequently. The cause is uncertain. In the course of studies on the basic causes of this disorder of citrus fruits various agents were used to accelerate or inhibit the development of pitting during storage. One material, a liquid polyethylene emulsion, was found to decrease the incidence and severity of rind breakdown of grapefruit even at storage temperatures at which severe pitting usually occurs. The studies presented here were made to determine the effect of two polyethylene formulations on the pitting of Marsh grapefruit.

Materials and Methods

The formulations of the two liquid polyethylene emulsion concentrates used were as follows:

	Emulsion A Per cent	Emulsion B Per cent
Polyethylene	20.0	30.0
Emulsifier[2]		7.5
Potassium hydroxide		0.7
Oleic acid	4.0	
Morpholine	4.0	
Water	72.0	61.8

These chemicals were obtained from the Allied Chemical Corporation and diluted to contain 10 per cent solids before use.

Marsh grapefruit from two commercial groves, one on rough lemon rootstock at Groveland, Florida, and one on sweet orange rootstock at Windermere, Florida, were used during the 1958-1959 season. Emulsion "A" was applied to two lots from the first grove and to three lots from the second grove. Emulsion "B" was applied to three lots from the first grove and to four lots from the second grove. The fruit was washed before treatment, and treated within three days after picking.

Fruit of average size, free of rind punctures was selected. The fruit was dipped singly into diluted emulsions of "A" or "B" for a period of 20-30 seconds. Each fruit was allowed to drain and then dried under a hot air dryer. The fruit was then stored 5 weeks at low temperatures. Inspection of the fruit was made on removal from storage and again after 7 days at 70° F, for severity of pitting and for decay. Pitting was classified as slight if the aggregate affected area was from 8 to 20 millimeters in diameter, moderate if from 20 to 32 millimeters, and severe if over 32 millimeters. Untreated samples were stored with each treated lot. Most of the storage tests were conducted at 40° F, because pitting occurs most readily at about this temperature.

[1] Received for publication August 17, 1959.
[2] Tergitol NPX, an alkyl phenyl polyethylene glycol ether.

Taste tests were conducted as described by Harding and Fisher (4).

Soluble solids were determined from refractive index readings, total acids by titration with sodium hydroxide, and ascorbic acid by titration with 2,6-dichloroindophenol.

Results and Discussion

In all tests with emulsion "A" the total amount of pitting was less in treated than in untreated fruit and the severity of pitting in the affected fruit was decreased (Table 1). At the end of the holding period the treated fruit remained firm and retained good color but had somewhat more decay than the untreated fruit.

Fruit treated with emulsion "B" also developed less pitting during 40° F storage than untreated fruit (Table 1). Fruit treated with emulsion "B" however, tended to become soft during storage. This may have led to the increased decay after removal from storage. Possibly a fungicide could be incorporated in the emulsions to decrease the amount of decay, as has been done with commercial water-wax emulsions. This point is receiving consideration.

Fruit treated with polyethylene "B" and stored at 32 and 50° F. remained relatively free of pitting both during storage and the 7-day holding period at 70° (Table 2). At 32° F storage, 80 per cent of the treated fruit was sound after the 7-day holding period, whereas only 16 per cent of the untreated fruit remained sound. At 50° F storage, 84 per cent of the treated fruit was sound after the holding period, and 66 per cent of the untreated fruit was sound. Of particular interest was the fact that treated fruit stored at 50° F retained its yellow-green "fresh" color, whereas the untreated fruit developed the usual yellow-orange color typical of the fruit stored at higher temperatures. Although at 70° F little pitting or decay developed, both treated and untreated fruit became shriveled and unappealing in appearance after about three weeks.

Weight losses during storage indicated that the polyethylene treatment probably did not interfere with transpiration or normal gas exchange. This was most evident in fruit stored at

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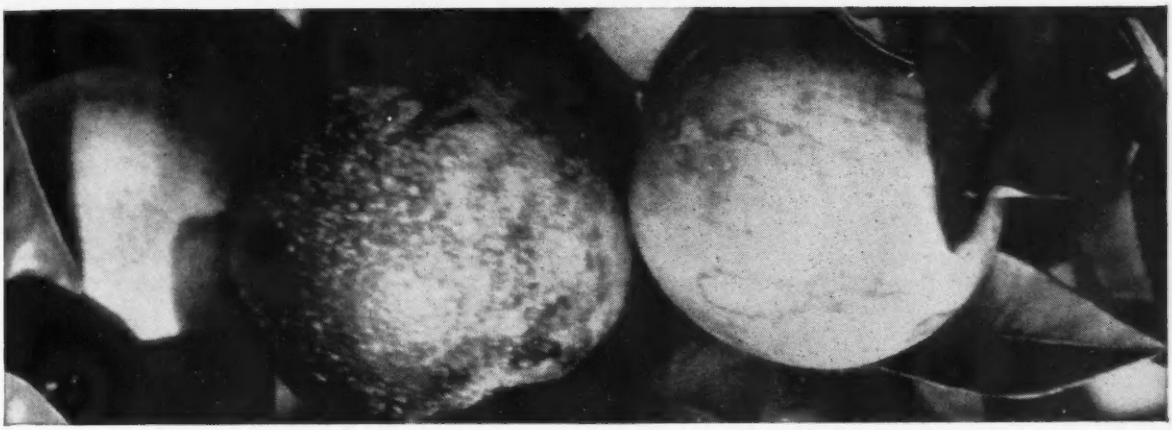
Table 1.—Effect of polyethylene emulsions on pitting and decay of Marsh grapefruit stored for 5 weeks at 40° F, and held at 70° F for 1 week.

Formulation	Item	On removal from 40° F Storage		After 1 week at 70° F	
		Treated[A]	Untreated	Treated	Untreated
A[B]	Number fruit	241	369	—	—
	Sound fruit, %	79	47	61	36
	Slight pitting, %	16	33	17	29
	Moderate pitting, %	4	10	3	13
	Severe pitting, %	1	9	2	11
	Decay, %	0	1	17	11
B[C]	Number fruit	305	527	—	—
	Sound fruit, %	70	34	47	25
	Slight pitting, %	16	26	11	22
	Moderate pitting, %	7	16	5	15
	Severe pitting, %	4	23	4	22
	Decay, %	3	1	33	16

[A] Emulsions contained 10 per cent solids.
[B] Figures are averages of 5 individual tests.
[C] Figures are averages of 7 individual tests.

Stop russeting and greasy spot

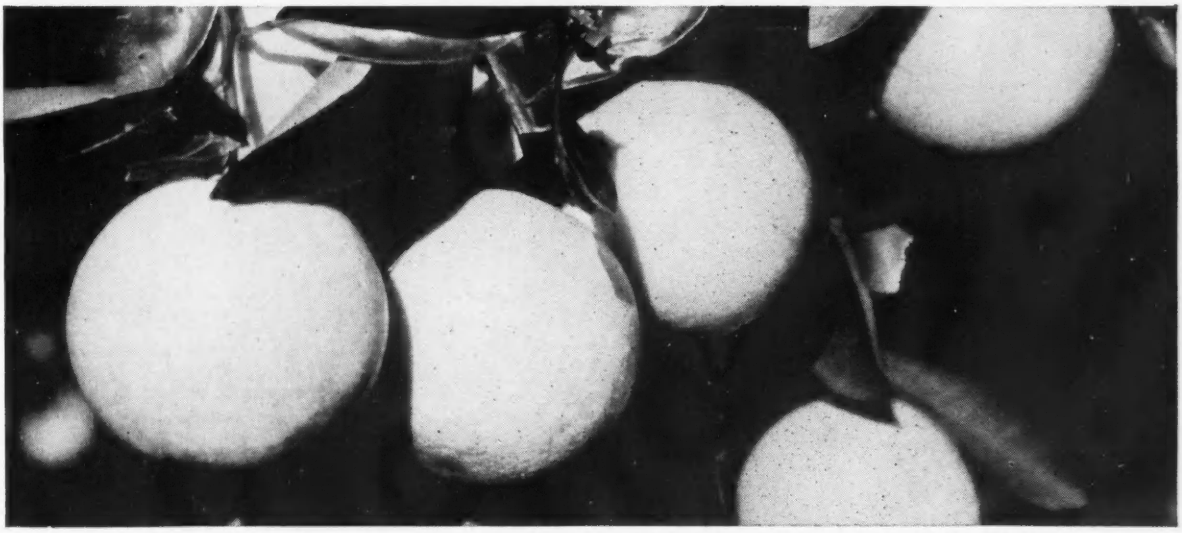


Disease spreads fast in citrus. It can't be cured . . . must be prevented. A spray program with Du Pont "Parzate" C will keep rust mites and greasy spot from cutting into your citrus profits.

...spray with Du Pont PARZATE® C

ZINEB FUNGICIDE

developed expressly for Florida citrus growers



To get this kind of clean, disease-free fruit, spray with "Parzate" C zineb fungicide. Citrus protected this effective way yields better-quality fruit for more profits.

Protect your oranges and grapefruit from the ravages of rust mites and greasy spot. Du Pont "Parzate" C stops these profit destroyers. Developed specially for Florida citrus groves, this wettable powder boosts yields, gives cleaner, brighter fruit . . . healthier, disease-free foliage . . . sturdy new growth.

"Parzate" C means extra savings, too. You can mix it with oil and parathion to lower spraying costs. Since there's less material for pumps and nozzles to handle, equipment wear is greatly reduced. And "Parzate" C is neutral in action—won't affect soil pH. For sure protection against citrus disease . . . for better fruit and bigger profits . . . order a supply of Du Pont "Parzate" C from your dealer now.

On all chemicals follow labeling instructions and warnings carefully.

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING
. . . THROUGH CHEMISTRY

PARZATE® C

ZINEB FUNGICIDE

THE REDUCTION OF RIND BREAKDOWN OF MARSH GRAPEFRUIT BY POLYETHYLENE EMULSION TREATMENTS[1]

(Continued from Page 10)

70° F, where fruit treated with polyethylene "B" lost 11 per cent in weight and untreated fruit lost the same.

Chemical analyses of the juice of fruit stored at 32, 40, and 50° F showed no effects as the result of polyethylene treatment (Table 3).

80-100, which is termed pleasantly tart to sweet, a pleasant blend of sugars and acid, with very good texture and flavor.

A recent review of chilling injury by Pentzer and Heinze (6) pointed out the complexity of the pitting process. The polyethylene film may protect the rind from atmospheric oxidation, or, being slightly basic, may protect the rind from accumulated acidic materials. The effect of the polyethylene film may be a matter of prevention of desiccation since it has been reported by Brooks and McColloch

Table 2.—Effect of polyethylene emulsion "B" on pitting and decay of Marsh grapefruit stored at 32°, 40°, 50°, and 70° F for 6 weeks and held at 70° F for 1 week.

Temperature	Item	On removal from storage		After 1 week at 70° F	
		Treated[a]	Untreated	Treated	Untreated
32° F	Number fruit	50	50	—	—
	Sound fruit, %	98	94	80	16
	Slight pitting, %	2	4	14	64
	Moderate to severe pitting, %	0	2	0	16
	Decay, %	0	0	6	4
	Weight loss, %	1	0	—	—
40° F	Number fruit	50	60	—	—
	Sound fruit, %	60	38	46	30
	Slight pitting, %	20	32	10	26
	Moderate to severe pitting, %	20	28	14	38
	Decay, %	0	2	30	6
	Weight loss, %	1	0	—	—
50° F	Number fruit	50	50	—	—
	Sound fruit, %	98	80	84	66
	Slight pitting, %	0	0	0	0
	Moderate to severe pitting, %	0	0	0	0
	Decay, %	2	20	16	34
	Weight loss, %	0	0	—	—
70° F	Number fruit	50	50	—	—
	Sound fruit, %	84	78	80	76
	Slight pitting, %	4	2	6	2
	Moderate to severe pitting, %	0	2	0	2
	Decay, %	12	18	14	20
	Weight loss, %	11	11	—	—

[a] Emulsions contained 10 per cent solids.

The palatability of grapefruit was not impaired by polyethylene treatment. In the taste tests no distinction could be made between fruit treated with emulsion "A", that treated with emulsion "B", and untreated fruit, all of which had been in storage at 40° F for 5 weeks and held at 70° F for one week. All fruit received a rating of

(1) that pitting of grapefruit is much worse at low than at high humidities. Similar findings with oranges have been reported by Grierson (3). Morris and Platenius (5) found that the severity of pitting of cucumbers was inversely proportional to the relative humidity of the storage atmosphere, although they felt that desiccation was not the initial cause of pitting, but the result of injury to certain cells of the epidermis. Waxing and the use of oiled wrappers reduced pitting in lemons (2), and in grapefruit (1). This effect was attributed to an increase in carbon dioxide content in the internal atmosphere. Thus, another possibility is that the polyethylene film alters gas exchange in a manner which reduces rind injury.

If the costs are not prohibitive, if decay can be controlled, and if there are no health hazards in the use of the fruit so treated, the application of polyethylene coatings offers possibility for commercial use.

Table 3.—Chemical composition of the juice of Marsh grapefruit treated with polyethylene emulsion "B", and untreated fruit after storage at 32°, 40°, and 50° F for 6 weeks.[a]

Item	32° F		40° F		50° F	
	Treated[b]	Untreated	Treated	Untreated	Treated	Untreated
Total soluble solids, %	10.69	10.58	10.64	10.64	10.69	10.59
Total acids, %	1.26	1.30	1.34	1.25	1.27	1.31
Solids to acid ratio	8.48:1	8.14:1	7.94:1	8.51:1	8.42:1	8.08:1
Ascorbic acid, mg./ml.	0.30	0.33	0.34	0.33	0.33	0.34

[a] Averages of 25 fruit.
[b] Emulsions contained 10 per cent solids.

Summary

Rind breakdown, or pitting, of grapefruit was reduced substantially by treatment with emulsions of polyethylene before storage. Treated fruit retained normal color and developed no off-flavors or differences in chemical composition of the juice due to polyethylene treatment. Of the two emulsion formulations tested, polyethylene-oleic acid-morpholine was found to be superior to polyethylene-Tergitol NPX-potassium hydroxide.

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CHECKING GOVERNORS CUTS TRACTOR COSTS

It's a money-saving practice to check farm tractor governors regularly, says J. B. Richardson, University of Florida agricultural engineer.

Poorly adjusted governors waste fuel and cause power loss when pulling is hardest. It's one of the most commonly overlooked sources of poor fuel efficiency.

In recent tests 85 percent of the tractors checked had governor speeds either too high or too low, according to manufacturer's recommendations.

Each working day during the past year, federal meat inspectors of the U. S. Department of Agriculture kept about a million pounds of unfit meat from reaching U. S. consumers.

Plant Quarantine... First Line Of Defense

. . . BY . . .
DR. W. G. COWPERTHWAITE
DIRECTOR OF PLANT INDUSTRY
DIVISION, FLORIDA STATE
DEPARTMENT OF AGRICULTURE

The term "quarantine" means simply 40; that is, a 40-day period. The first quarantine was set up in the 14th century in Venice and applied to ships arriving in ports from countries where diseases such as bubonic plague, yellow fever and cholera were known to exist. Ships crew and passengers were forced to remain on board so that any latent cases of infectious diseases would have time to develop before any persons could land.

In 1799 a federal act required the United States agencies to aid port cities and states in enforcing health regulations. In 1850 international quarantine codes were drawn up relating to ships and commerce. In 1912 the first Federal Plant Quarantine Act became law.

The original isolation period of 40 days has a biblical rather than a scientific background, and probably was meant to establish an adequate detention period. In modern times the term quarantine has lost its connotation of a definite time period, and as it is understood today it comprises the detention and inspection features and the many practices that go with it. The fundamental concept of quarantine is now one of giving some public agency the authority, duty and power to establish some type of barrier against the dissemination of injurious pests.

The field of plant quarantines is a complex one, requiring understanding and cooperation of many interests. Plant quarantine is the utilization of knowledge by a legally constituted authority to prevent the entry and spread of injurious crop pests as a public service. This activity affects directly or indirectly then, practically all the citizens of our country, whether they are directly engaged in agricultural pursuits or not.

There are several factors involved in establishing a plant quarantine:

(1) Biological — A knowledge of the pests likely to cause damage, the host ranges, and the possible method for control or containment must be understod.

(2) Popular support by general public who will have to live under disciplines imposed by the agency enforcing the quarantine. The technical knowledge, legal powers, and financial support to impose a quarantine are not alone sufficient to insure the success of any action. The action must have the backing and approval of the public, based upon intelligent understanding and widely disseminated factual information.

(3) Legal features — Plant quarantine program affects the lives, habits and freedom of action of a large group of individuals. It may impose additional duties, responsibilities, cause financial losses and in general affect their rights and privileges as citizens.

This interference with a person's rights and privileges should not be undertaken unless forced by biological necessity and backed by sound legal authority. Generally, quarantine action involves the passage of an empowering act, leaving the details to administrative rules and regulations that are adopted under specific procedures.

(4) Administrative aspects — Any

Insects
Boll Weevil — 1890
Pink Bollworm — 1917
Japanese Beetle — 1916
Corn Borer — 1909
Gypsy Moth — 1868
White-fringed Beetle — 1936
Imported Fire Ant
Sweetpotato Weevil — 1875
Mexican Bean Beetle — 1921

Weed
Witchweed — 1950

Diseases
Citrus Canker — 1908-10 ?
Dutch Elm Disease — 1930
Flag Smut — 1918
Late Blight Fungus — 1900

Nematodes
Bulb Nematode — 1914

quarantine should be established in accordance with available knowledge and facilities and within the legal powers granted to carry out measures to suppress or prohibit movement or entry of crop pests in so far as community interest will permit, and public opinion and biological factors will support.

In administering plant regulatory programs, contact with scientific organizations, legislative bodies, and trade and industry groups, must be maintained; and these groups must be kept informed of progress being made as well as problems being met. As the situation changes, additions or corrections to operating rules and regulations must be made, based on biological factors. These changes may be dictated by surveys, inspections, treatment, and scientific advancement.

So much for the historical and theoretical aspects of plant quarantine.

It is a fact that about 50% of the pest species most destructive to our agriculture have been introduced into this country. Some of the more important introduced pests, and their probably date of introduction, against which control, suppression, or eradication programs are currently being conducted, are:

The above examples are only a partial list of organisms which have been introduced that represent a hazard to the agricultural interests of this country. More recent introductions are Medfly in 1956 — since eradicated at a cost approximating $11,000,000 — quick decline of citrus, potato rot nematode and golden nematode.

The plant quarantine system's responsibility is to prevent the entry into the United States of destructive foreign plant pests. This is our first line of defense. In carrying out this responsibility, the Plant Quarantine Division of the United States Department of Agriculture, comprised of approximately 500 inspectors, intercepted 30,230 lots of plant pests at various ports of entry in the fiscal year 1960. This figure was 20% greater than interceptions for the previous year, and some few times greater than the increase in passenger traffic. This may mean more to you in another way; that is, one important plant pest intercepted every 17 minutes last year.

Fruit flies figured prominently in these interceptions: 173 Mediterranean — 170 Mexican — 120 West Indian — 52 Olive — and 10 Oriental. This group actually represented a 31% increase over similar interceptions in 1959.

Citrus canker was intercepted 131 times — Japanese scale 313 times — khapra beetle 131 times — black spot of citrus 109 times — sweet orange scab 97 times — Mediterranean land snails 75 times — and Chilean grape mite 41 times. There are many other important interceptions but the above will serve to indicate the wide variety of pests intercepted.

To intercept the above pests, quarantine officials inspected 8,474,817 pieces of baggage arriving by air; as well as 737,000 pieces of baggage carried by passengers. Inspectors at sea ports checked 3,739,476 pieces of baggage from foreign countries. Inspectors at the Mexican border checked 22,600,000 vehicles prior to entry into the United States, which required examination of another 7,000,000 pieces of baggage.

The increase in travel can best be illustrated by comparing 1955 and 1960 plane, ship and car arrivals in the United States from foreign countries: 51,757 ships in 1955 compared to 60,394 ships in 1960; 88,873 planes in 1955 compared to 139,415 planes in 1960; and, 15,240,649 vehicles in 1955 compared to 22,656,765 vehicles in 1960. It is obvious that as travel increases, the danger of pest introduction increases from sheer increase in number.

Quarantine activity involves more than just inspection at ports of entry. It involves the attitude and behavior of each and every individual entering or leaving this country. The attitude of the President and his Cabinet with respect to relationships with foreign countries is involved. Free and easy travel with little restriction might help to improve foreign relations among diplomats, but relaxation of baggage and cargo inspection to further these associations may be dangerous to the farmers or growers who might be called upon to eradicate, suppress, or control a newly introduced plant — or animal — pest.

It is, I believe, well understood that no quarantine service is perfect, and that on occasion an insect, disease, nematode or virus pest will gain entrance into this country. When this does happen, the Plant Pest Control Division, United States Department of Agriculture and the Division of Plant Industry in Florida will swing into action. An example of this type of cooperative effort was in the previously mentioned Medfly eradication program of 1956-57.

I might add that in Florida — backing up quarantine inspections — a state and federal trapping program involving 8,000 traps is constantly maintained. In addition, Division of Plant Industry inspectors are actively engaged in grove survey, nursery inspection, and other regulatory programs in all areas of the state. These men are trained to look for unusual crop or plant damage, whatever the cause, and send suspicious specimens to Division of Plant Industry specialists in the Gainesville laboratories.

One, of course, cannot overlook the private citizen who, as in the recent Medfly invasion, found a wormy fruit, took it to his County Agent, and from here to specialists for final and positive identification. We all have a stake in the quarantine program — our first line of defense — and in these agencies that are called upon to back up this first line.

I would like to mention one more factor that has an important bearing on the efficacy of the Quarantine Division. This is the men who comprise the working force. These men, on both the national and state level, are trained biologists, and in addition receive specialized training in schools established specificially for quarantine and inspection procedures. They know and understand the complexity of quarantine action, and are in a better position to realize when action should be taken than the average citizen. Administrators are unwilling to recommend quarantine action if individual action, based on sound technical advice, will solve the problem, or if a cooperative arrangement can be made covering the situation.

(Continued on next page)

The Value Of Mutual To The Indian River Grower

. . . BY . . .

L. DALE CARLTON

Delivered to the 14th Annual Indian River Citrus Seminar

It's a real pleasure to be here to talk about Mutual. Mutual has a slogan that says "cooperation is profit" and you here in the Indian River area have been practicing, learning and enjoying this fact for a long time. This has been true since about 1933 when the Indian River Citrus League was organized, and some of you much before that, in the several cooperatives that have operated in this area for so long.

The very fine reputation you have developed for the excellent citrus fruits grown in the River area is adequate testimony of your willingness and ability to work together toward a common goal — of course, the quality of the fruit has helped some too.

Your spirit of togetherness has been the force behind the outstanding work done by the Indian River Citrus League — by its board of directors — by the many organizations working for and serving growers in this area — even by M. R. Buckalew, the River area's ambassador to the rest of the world.

John Donne, a 16th century English poet, wrote "No man is an island, entire of itself; every man is a piece of the continent, a part of the main - - - - - -".

The citrus industry in Florida came to realize this in 1946 and 1947. A committee of the State Bankers Association after careful study characterized the industry as a "loose, sprawling, rapidly expanding, badly disorganized, unhappy and sick industry".

Growers throughout the citrus industry determined to do something for themselves and Mutual was the result. The final push that made the organization of Mutual complete and successful was given by you growers in the Indian River area. You who were first to realize that — "No man is an island, entire of itself" — you who had learned early the value of working together were willing to share your wisdom and experience with the rest of the industry.

What, then, did you get in return? What is the value of Mutual to the Indian River Grower?

First you get information. Mutual's information on prices, markets, inventories, movement, and Mutual's economic analysis of the citrus industry is considered to be the most factual and complete of any agriculture industry. Our statement that "Mutual members are the best informed agriculture producers in the world" is no idle boast. This information is relayed to the Indian River grower through

PLANT QUARANTINE — FIRST LINE OF DEFENSE

(Continued from preceding page)

Another principal to be kept in mind is that a quarantine should be imposed for pest protection purposes only. Any attempt to use plant quarantine as a cloak for trade protection or other ulterior motives should be discouraged. Any quarantine involves economic repercussions, some of which may be favorable to a given group or industry.

It is difficult to avoid such situations, but the position is defensible if based on sound biological principles of pest control. Quarantine, and its attendant regulations concentrate on materials, rather than on persons; even though placing responsibilities on importer, shipper and carrier.

Scientific integrity in plant quarantine actions must be maintained. Quarantine action is simply the application of scientific principles to a problem which may be partially social and economic. The public's respect and confidence in science is an asset to quarantine officials, and this must be maintained. It is admitted that at times quarantine procedures and programs involve much compromise and may involve a retreat to second best lines of action which, incidentally, may still provide a high degree of protection.

Progress in quarantine procedures will undoubtedly be made as science progresses. The building up and maintaining of our quarantine system will depend upon patient research, application of this research to quarantine procedures, a sound well-trained organization, and probably most important, the intelligent support of an understanding public.

our weekly publication "The Triangle".

Another informational service that has proved to be most popular with growers all over the state is the crop condition on-tree price report that appears from time to time in the "Triangle". This is information gathered by our fieldmen from growers, production managers, co-op managers, county agents, and fruit buyers as to conditions of trees and fruit on the trees, any particular problems that are confronting growers, and prices being paid to growers on-tree for their fruit. Growers in one county are interested in growers in another county and this is a means of "keeping in touch".

The daily market bulletin which goes to each shipper in the River area carries complete information on current (day by day) F.O.B. prices as well as spot prices being paid by the processing industry. Reports from our northern market areas also appear in the market bulletin and indicate trends in demand at both wholesale and retail levels, weather conditions in the market area and any local situations that may affect the movement of citrus. The bulletin also carries reports from our competing areas in Texas and California showing prices, movement, weather conditions, etc. Newspapers and wire services also pick up information from our market bulletin and run it regularly in their papers.

Mutual maintains a press relations division whose function it is to provide local newspapers over the state with citrus industry information. John Sike's "State of Citrus" column which I am sure many of you read, serves as an information media for growers. One of the Miami papers prints a special edition for the Indian River area and many of the news stories and feature stories carried there are written at Mutual.

Mutual has a weekly radio show that is heard throughout the citrus belt. Here, market information is relayed to the listeners as well as other information of interest and importance to the citrus grower.

Another area in which Mutual serves the Indian River Grower. Working with the League, Mutual is ever alert to protect the interest of growers before state and federal legislative bodies, boards, and commissions. Working to protect growers against legislation and regulations which are bad and seeking to promote legislation and regulations that are good.

As a result of this alertness and watchfulness — every piece of legislation passed by the state legislature in the last three sessions that pertains to citrus has first been examined and approved by Mutual. Not in the sense of seeking self or special interest, but in the sense of looking out for welfare of Florida citrus industry.

Mutual, as well, represents its members internationally. Recent efforts to prevent the importation of fruits from certain foreign countries and thus prevent the possible importation of Med flies or other devastating pests have been successful.

Confidence — stability — cooperation — just words perhaps — but they speak volumes about another prime service Mutual renders the growers in this area. Confidence on the part of both growers and buyers in the factual marketing information Mutual provides. Confidence on the part of growers and buyers in the accurateness of Mutual's economic analysis of the season ahead.

Confidence on the part of the entire citrus industry in the future of citrus in this great state. Confidence — stability and cooperation — brought about by better information, brought about by better understanding of each others problems and brought about by the earnest desire of one group to cooperate with another.

Leadership — overworked as a word but never overworked in principle or in practice. Florida Citrus Mutual means leadership to the Indian River Grower.

Leadership in striving toward tthe solution of many problems that confront him. This leadership takes form in the persons of the 21 citrus growers who serve as directors.

Leaders from every section and area of the citrus belt. Leadership in the person of Mutual's Advisory Committee who represents every phase of the citrus industry. Leadership in the person of Bob Rutledge, Mutual's General Manager, and his staff who serve Mutual members individually and collectively.

Leadership that generates new ideas and from these new ideas, new programs to broaden and expand our citrus marketing potential. Two very fine examples of this are Mutual's grapefruit spoon program in which over 6 million grapefruit spoons have been distributed all over the United States and Mutual's new citrus juicer that is generating an immense amount of interest.

Leadership that has re-opened foreign markets. Leadership that has developed new merchandising ideas and outlets. Leadership that can keep this industry aggressive, dynamic and progressive.

Col. and Mrs. Floyd Leave $250,000 To Indiana University

The beneficence of two Floridians, Col. and Mrs. Bayard F. Floyd, of Davenport, Polk County, Florida, both deceased, is permitting 11 students to study botany and bacteriology this year at Indiana University.

Col. Floyd, a graduate of the Hoosier state university who became a leading figure in the Florida citrus industry, and his wife left their $250,000 estate to the Indiana University Foundation. The bequest specified that the money was to be used to further study in botany and bacteriology, fields of Col. Floyd's life-long interest.

The Floyd Fund Scholarships were established by the University in 1956. Col. Floyd died in 1945 and his widow, Dixie Westlake Floyd, in 1955.

Awarded to students of outstanding ability, the scholarships vary in value from $1,900 to $2.000 for graduate students and from $150 to $1,000 for undergraduates. The first in botany were awarded last year and the first in bacteriology this year.

Col. Floyd was a native of Kempton, Ind. He served as plant physiologist as the University of Florida Experiment Station, was for many years secretary of the Florida Horticultural Society, and was vice-presiden of the Wilson-Toomer Fertilizer Co., of Jacksonville. He also was associated with Earl W. Brown, of DeLand, and the late Lorenzo Wilson, of Jacksonville, in the organization in 1934-35 of the Florida Citrus Institute, forerunner of the Florida State Citrus Commission.

USE GRAPEFRUIT AT ANY MEAL

Nearly everybody welcomes grapefruit for breakfast, but it can be more than just a fruit for breakfast. Use grapefruit at almost any meal, and serve it in many interesting ways.

Even at breakfast, variety can be injected by serving broiled grapefruit, or by preparing the fruit the night before and filling the center core holes with strained honey and keeping the fruit in the refrigerator overnight. This gives the honey time to penetrate to other parts of the fruit.

27 Years of Citrus Costs And Returns In Florida---1931-1958

. . . BY . . .

ZACH SAVAGE
AGRICULTURAL ECONOMIST
FLORIDA AGRI. EXP. STATION

Through the cooperation of interested citrus growers, the Florida Agricultural Extension Service, which includes County Agents of the citrus producing counties and the Agricultural Experiment Stations, have conducted citrus costs and returns studies since 1931. The Extension Service study has included an average of 233 groves each season for 27 seasons, 1931-58.

The groves included in this study were scattered over the citrus producing area of Florida. From 75 to 86 percent of the groves have been in the four counties of Polk, Lake, Orange and Highlands, varying somewhat in different seasons. During this season 86 percent of the groves and 79 percent of the acreage were in the four counties named. Thirteen counties were represented in the study that season.

Averages of data from these groves are not presented as averages for the entire state of Florida. Groves included in these records are those of cooperators who would supply records. These groves usually have higher yields than the average grove of Florida, and it is presumed fruit is produced by these groves at somewhat lower costs per box. However, it is believed that trends in averages for these groves are similar to the trends in corresponding averages for all Florida groves of similar ages.

Total acreage in groves of all ages included in these records in 1957-58 expressed as a percentage of the total Florida citrus acreage was 1.33 percent. The proportion that the total number of boxes of fruit harvested from record groves that same season was of the total citrus fruit production in Florida was 1.56 percent. The latter figure is 17 percent higher than the former indicating that the yield on record groves was 17 percent higher than the average for all groves of the State.

The total acreage in groves of cooperators varied from 2,036 in 1931-32 to 10,479 in 1940-41. The average for the 27 seasons was 8,312 acres each season.

Acreage Per Grove

Acreage per grove for the 27 seasons averaged 37 acres for the younger group and 35 acres for the older group of groves. In 1957-58 the average for groves 10 years of age and under was 43 acres per grove, 43 acres for groves over 10 years of age, and 43 acres for all groves. More than half of the groves included in this study contained less than 15 acres per grove.

The above paragraph on acreage per grove is based upon the grove units used in grove accounts. Ten of these grove units for accounting purposes were actually of multiple ownership in each of the units. These ten units represent a total of 171 grove ownerships. Recognizing these ownerships, there are 334 ownerships in the accounts listed as 173 groves. With 334 ownerships of 7,410 acres of groves in 1957-58, each ownership represents an acreage of 22.2 acres each. It has been claimed by some that there are 30,000 ownerships or properties in the state of Florida. If this is true, the 610,700 acres in Flor-

ida groves in 1957-58 would amount to 20.4 acres per ownership. From these figures it appears the acreage per ownership in account groves was 1.8 acres or 9 percent larger per ownership than for the state as a whole.

Trees Per Acre

Many calculations for large citrus acreages or the state acreage as a whole are on the basis of 65 trees per acre of land. The acreage included in this study averaged 61 trees per acre for the young group, 61 for the older group and 61 for both groups in 1957-58. Ninety-two percent of all groves of this study had less than 80 trees per acre.

Age of Grove

Citrus trees produce fruit somewhat in proportion to age. Age of tree from time of setting in the grove is the easiest and most convenient method of designating groves when comparing yields, costs and returns. From the inception of this work, groves have been divided into two age groups: Groves 10 years of age and under and groves over 10 years of age.

Distribution according to average age of trees of the 173 groves included in these data in 1957-58. The average age of individual groves varied from 3 to 60 years. Eight percent of these groves were 10 years of age or less and the average age of groves included that were 10 years of age and under was five years. Ninety-two percent were over 10 years of age, and the average age of these 12 groups was 33 years. Sixty-seven percent of all groves were 26 to 40 years of age, and these same ages made up 73 percent of the groves over 10 years of age.

Trees seldom produce fruit during the first two seasons after setting. Some fruit is usually produced during the third season. Substantial increases in yield are common each season after the third year for a number of seasons. Data on tree ages of 16 years and older for the state are not available, which precludes the possibility of making a comparison of tree ages of this study with those of the state.

Many groves included in this study had mixed ages of trees. In such cases the average age was used. This average was weighted by the number of trees of each age.

Percent of Trees Grapefruit

The proportion or percent of the trees that were grapefruit influenced yield and cost. Production costs of bearing ages of grapefruit trees are usually higher per acre and lower per box than orange. A higher proportion of the younger group had 10 percent or less of the trees that were grapefruit than the older group. Seven percent of the trees in the younger group were grapefruit as compared to 27 percent in the older group. Over the 27 seasons, 24 percent of the trees in the state were grapefruit as compared to 29 percent in the case of all record groves.

Percent of Fruit Grapefruit

Grapefruit trees usually produce higher yields than orange trees of the same age. This results in a higher proportion of the fruit being grapefruit than the proportion of trees that are grapefruit. These proportions of fruit vary somewhat by variety and age.

The average number of boxes of fruit harvested from this group of groves was 84 boxes per acre for the entire period. The average yield of 84 boxes per acre is 34 percent of the yield of the older group of groves 24 years of age.

Operating costs per acre averaged $69.75 for the 27 seasons of 1931-58. This average is 59 percent of the operating costs of the older group of groves which had an average age of 34 years.

Returns from fruit averaged $97.69 per acre for the 27-year period. This was 37 percent of the returns for the older group. Returns per box were slightly higher on the younger group. This was due, in part at least, to the smaller proportion of grapefruit in the younger group, since grapefruit usually brings a lower price.

Returns above operating costs average $27.94 per acre annually for the 27-year period. This was 19 percent of the corresponding figure of the older group. There were seven seasons, 1932-33, 1951-52, 1952-53, 1954-55, 1955-56, 1956-57 and 1957-58 when returns from fruit failed to pay operating costs. Per-box returns above operating costs averaged 33 cents for the 27-year period.

Upon dividing the first 15 years of this period into three 5-year periods, the per-box returns above operating costs were 16, 30 and 111 cents, respectively, for the three periods. High fruit prices during the latter period accounted for the good showing of the period when prices by seasons ranged from 96 cents to $2.02 per box. The five seasons of 1946-51 averaged 40 cents in returns above operating costs, and the average for the five seasons of 1951-56 was a loss of 47 cents per box. The average age of the latter seasons was only four years.

Interest on investment in grove land and trees was calculated from the grove operator's estimate of the valuation. The estimate requested was the investment in land and trees from the point of view of a long-time fruit-growing enterprise. Such valuations are often less than prices of grove sales during periods of high fruit prices, and are usually higher than grove sale prices during periods of depressed fruit prices.

Interest on estimated grove valuation at 6 percent averaged $27.00 per acre for the 27 seasons. This figure was 63 percent of the interest on the older group of groves.

Total cost without owner supervision includes operating costs and interest on the grove investment. Interest on the grove investment is a production cost, although many growers do not so consider it. When interest is not considered as a cost, the operating costs figure is the one desired.

Total cost without owner supervision averaged $96.75 per acre for the 27-year period, or $1.15 per box. This per acre figure was 60 percent of the corresponding figure for the older group of groves. The per-box figure of $1.15 was 77 percent higher than that of the older groves.

Net returns, after considering interest on the grove investment as a production cost, averaged $0.94 per acre annually, or one cent per box. There were 16 of the 27 seasons when returns from fruit were less than the total cost without owner supervision.

Groves Over 10 Years of Age

The number of groves of these records over 10 years of age varied from 45 to 272 per season and aver-

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TWENTY-SEVEN YEARS OF CITRUS COSTS & RETURNS IN FLORIDA — 1931-1958

(Continued from Page 18)

aged 204. The first two seasons, 1931-32 and 1932-33, had considerably less than the average number of groves included. The grove acreage varied from 583 acres in 1931-32 to 9,853 acres in 1940-41, and averaged 7,255 acres per season.

The acreage per grove included in these records has not varied violently since the second season. The average acreage per grove was 13 acres for the 1931-32 season. Since that time the seasonal average has varied from 31 to 43 acres per grove, and the average for the 27 seasons was 35 acres. The acreage per individual grove varied from slightly less than two acres to 777 acres, with 63 percent with less than 20 acres in the 1957-58 season and 82 percent with less than 40 acres.

The average age of groves from time of setting the nursery stock varied by seasons from 17 to 33 years and averaged 24 years for the 27-year period. The average age of the 160 groves included in the 1957-58 season was 33 years. The age of grove should be kept in mind when comparing data, as it is accountable for a sizeable portion of the variations between groves or groups of different ages. Over the 27-year period the average increase per acre of the 33 year old groves over the 17-year old groves was:

Number of boxes harves	50 percent
Total operating costs	48 percent
Returns from fruit	50 percent
Returns above operating costs	51 percent

The number of trees set per acre remained rather static around 60 trees for the older group of groves throughout the record period. Such is not true of the younger group. This group increased from 60 in 1931-32 to 65 trees per acre in the 1935-36 season and recent seasons have varied between these two figures. Intervening seasons averaged as high as 78 trees per acre. The average for this group during the entire period was 67. The average for the older group was 61.

It should be pointed out that these data include records for some groves for only one season. Other groves were included for varying numbers of seasons up to the entire 27 seasons. There were 13 groves included in these data for the 27 successive seasons. This turnover of the groves making up the records materially affected the number of trees per acre from season to season. The 5-year averages for the younger group were 62 during 1931-36, 70 during 1936-41, 75 during 1941-46, 68 during 1946-51 and 62 during 1951-56. The sample of younger groves has been rather small of recent seasons, so much so that upon the groves attaining the age of 11 years and transfer into the older group, there have not been sufficient acreages to increase materially the average number of trees per acre of the older group.

The percent of trees grapefruit is another important consideration when comparing the fruit harvested, costs, returns and net returns. Grapefruit groves usually have higher yields, higher costs per acre, lower returns and net returns per acre than orange groves of comparable ages. The cost per box is usually lower for grapefruit due to the higher yields. The lower price usually received for grapefruit results in lower returns per acre, and lower net returns per acre and per box.

The percentage of trees grapefruit averaged 31 for the 27 seasons for groves over 10 years of age. Individual seasons varied from 28 to 35 percent grapefruit trees.

Boxes harvested per acre averaged less than 200 each season prior to 1942-43, with the exception of the 1938-39 season when the average was 205 boxes. Average fruit harvested since that time, 1942-58, ranged from 225 boxes in 1944-45 — which was materially lowered by hurricane damage — to 447 boxes in 1953-54. The 1953-54 figure was the highest of the 27 seasons and was 24 percent higher than the second highest, 360 boxes in 1950-51 and 386 percent higher than the 92 box average in 1933-34. The average age of groves in 1957-58 was 33 years, which was five years older than in 1950-51 and 16 years older than in 1933-34. There were 10 of the 27 seasons, 37 percent, when less than 200 boxes were harvester per acre. The average age of trees during these 10 seasons was 19 years.

The average number of boxes harvested per acre for each of the five-year periods were: 1931-36 — 126; 1936-41 — 175; 1941-46 — 250; 1946-51 — 314 boxes and 1951-56 — 359. Yield for the third period was double that of the first, and the fifth period was 285 percent of the first. Some of the reasons for these increases in the number of boxes harvested per acre were increases in average age of trees, better fertilizer practices, larger proportion of fruit harvested due to good prices and the development of fruit processing.

Fruit prices were low for some seasons of the first two 5-year periods, resulting in some of the fruit remaining unharvested. Less damage from low temperatures and better grove care in general during the last three periods contributed to higher yields for these periods; and higher prices together with the development of fruit processing facilities, contributed to higher proportion of the fruit being harvested. The number of boxes harvested per acre varied from 16 to 741 on 160 groves over 10 years of age in the 1957-58 season. Forty-eight percent of these groves had less than 350 boxes harvested per acre in 1952-53 and 14 percent in 1954-55 and 71 percent in 1957-58. Ninety-seven percent had less than 550 boxes in 1957-58. From 46 percent of these groves less than 250 boxes were harvested per acre in 1957-58.

Operating costs were made up of five items: (1) Labor, power and equipment, (2) fertilizer materials, (3) spray and dust materials, (4) state and county taxes and (5) miscellaneous costs. Operating costs for the first eight years of this study, 1931-39, averaged $57.90 per acre. The following season, 1939-40, such costs were $53.45. There was an increase in operating costs each year from 1939-40 to 1946-47, which means an increase each season for seven successive seasons. During part of this time, the increase was rather rapid, and these costs were $159.89 per acre in 1946-47.

Operating costs in 1947-48 were only $1.51, or one percent, less than for the previous season. Such costs in 1949-50 were 21 percent less than in 1946-47, and eight percent less than in 1948-49. The 1950-51 operating costs were $160.67, or 27 percent more than 1949-50, and 78 cents more than the next highest season of 1946-47. The 1957-58 costs were 36 percent higher than 1950-51 and 486 percent of the lowest cost season of 1934-35. Operating costs per acre in 1957-58 were $218.08, the highest of these seasons.

Operating costs exceeded 50 cents per box eight times in the 26 seasons, 1931-32, 1933-34, 1944-45, 1946-47, 1954-55, 1955-56, 1956-57 and 1957-58. The average for all seasons was 48 cents. During the 1939-44 period, when operating costs were increasing on the per-acre basis, the per-box costs fluctuated from 30 to 33 cents. Such costs were 52 cents in the 1944-45 season.

Hurricane winds materially reduced the fruit harvested in 1944-45, which increased the costs per box. Also, an increase of 25 percent over the previous season in operating costs per acre further increased the per-box costs. Eight of the 27 seasons had operating costs of less than 40 cents

per box, and seven of these seasons were in the 1937-44 period.

Operating costs per box averaged 83 cents during the 1957-58 season, the highest of the 27 seasons. The range was from 22 cents to $5.37. Twenty-three percent of the groves had such costs of less than 50 cents. Another 25 percent had costs from 50 to 79 cents and 52 percent had costs of 80 cents or more per box.

Operating costs per acre by individual groves ranged from $47.90 to $397.20 in the 1957-58 season and averaged $218.08. On 49 percent of the groves $200 or more per acre was spent for operating costs that season.

Average operating costs by seasons ranged from $44.90 to $218.08 per acre and from 30 to 83 cents per box.

More money was spent for labor, power and equipment than any other cost item. The average was $54.30 per acre per season and ranged from $17.33 to $116.14. This cost exceeded the cost of fertilizer materials in 19 of the 27 seasons. The spread between the costs of the two items increased during recent seasons with the cost of labor, power and equipment increasing faster than fertilizer materials.

There were 10 seasons, 1932-42, when the operating costs did not amount to as much as the cost of the one item of labor, power and equipment for any one of the past 12 seasons, 1946-58. Money spent for this item was $109.33 per acre in 1957-58, the second highest of the 27 seasons. The increases in the number of boxes harvested as this period progressed lessened very materially the increases in the cost on a per-box basis.

Labor, power and equipment costs per box were 27 cents in 1946-47, an increase of four cents over the previous season. Such costs were three cents less in 1947-48 than in 1946-47, and decreased to 19 cents in 1948-49 which was five cents less than 1947-48. The average for the 27 seasons was 22 cents.

The cost item of second importance was fertilizer materials. This item was 34 percent of the average operating costs and amounted to $40.42 per acre. The range in the seasonal cost per acre for fertilizer materials was from $17.74 to $66.43. During 37 percent of the seasons this item averaged less than $30 per acre. Fertilizer cost was $37.92 per acre in 1931-32 but was not that high again until the 1943-44 season.

These costs increased for the following three seasons when the high up to that time of $57.33 was reached in 1946-47. There was a reduction of 32 percent in such costs in 1948-49 as compared to 1947-48, and a further reduction of 5.6 percent in 1949-50 under 1948-49. A major contributing factor was low fruit prices. Fertilizer material costs increased to $66.43 in 1954-55 which was the highest of the 27 seasons. Fertilizer expenses for 1957-58 at $61.42 per acre was 8 percent under 1954-55.

Fertilizer costs per box varied from 22 cents in 1931-32 to 11 cents in 1939-40 and 1940-41. There were 17 seasons with such costs less than 18 cents. Fertilizer cost was 18 cents in 1947-48, which was a decrease of two cents from the previous season; and 1948-49 showed a fertilizer cost of 12 cents, a decrease of six cents under the previous year. Such cost for 1957-58 ranged from two cents to $2.76 per box and averaged 23 cents. Thirty-one percent of the groves had a fertilizer cost of less than 20 cents per box and 49 percent less than 25 cents.

Nitrogen is an important element in fertilizers added in citrus production. The range was from 0.24 to 8.21 pounds of nitrogen applied per box, and the average was 0.77 pound. There were 16 percent of the groves that had less than 0.50 pound applied per box, and 49 percent had less than 0.80 pound.

There were 73 percent of the groves that received 0.60 pound or more. The usual recommendation as to the amount of nitrogen to apply is 0.40 pound per box of oranges anticipated and 0.30 pound per box of grapefruit. There were 14 percent of these groves that received amounts of nitrogen within the range of 0.30 to 0.49. An additional 2 percent received less than 0.30, making 16 percent that received less than 0.50 pound of nitrogen per box harvested. The remainder, 84 percent of the groves, received 0.50 pound of nitrogen, or more, per box. Fifty-one percent of these groves received 0.80 pound or more per box of fruit. Nitrogen added per box of fruit harvested for the 11 seasons of 1941-52 averaged 0.53 pound.

Spray and dust material costs averaged $10.10 per acre for the 26 seasons and constituted 9 percent of the operating costs. There were 13 seasons, 48 percent, with spray and dust material costs of less than $8.00. The range of the seasonal averages was from $2.99 in 1935-36 to $23.36 in 1954-55 and was $20.52 in 1957-58. The range in such costs per box was from two to eight cents, and the average was four cents. Sixteen seasons, or 59 percent, had such costs of three cents per box or less.

Spray and dust materials cost $20.52

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16th ANNUAL GULF COAST CITRUS INSTITUTE

Friday - April 28th

Pasco County Agricultural Center

Morning Session — 9:00

Presiding — Fred P. Lawrence, Citriculturist, Agricultural Extension Service

Invocation

Opening remarks and announcements — J. F. Higgins, County Agent, Pasco County

Meeting the 1961 Spray Problems — James E. Brogdon, Associate Entomologist, Agricultural Extension Service

Producing Tangerines for the Greatest Financial Yield Per Acre — Arthur F. Mathias, Jr., Production Manager, Haines City Citrus Growers Association

Variety Susceptability to Cold — Jack T. McCown, Assistant Citriculturist, Agricultural Extension Service

Recess

Florida Can Market a 125 Million Box Orange Crop — Martin E. Hearn, Director, International Trade Division, Florida Citrus Mutual

Value of Special Stimulating Fertilizers to Overcome Disasters — Dr. Paul F. Smith, Plant Physiologist, U.S.D.A. Horticultural Station

Noon

Afternoon Session — 1:30

Presiding — Jack T. McCown, Assistant Citriculturist, Agricultural Extension Service

Spray Residues — Watch Your Step — Frank L. Holland, Manager, Florida Agricultural Research Institute

Recess

What is the Value of an Individual Citrus Tree?—When is it Time to Remove a Bearing Tree? — Zach Savage, Economist, Agricultural Experiment Station

The Fruit Splitting Problem — Dr. Ivan Stewart, Associate Biochemist, Citrus Experiment Station

Management Problems in Old Citrus Groves — Fred P. Lawrence, Citriculturist, Agricultural Extension Service

FLORIDA ORTHO® CITRUS SPRAY PROGRAM

Dormant Spray *(December 20 to February 10)*

ORTHO Nutritional S-C-Z-Mn-B Spray No. 2	**Dosage:** 60 lbs./500 gals.	**Controls:** Citrus Rust Mite, Scab, Melanose, Copper, Zinc, Manganese, Boron Nutrition—Yellow Spot
ORTHO Sodium Molybdate	**Dosage:** 5 ozs./500 gals.	
ORTHO Spray Sticker	**Dosage:** 40 ozs./500 gals.	

Note: ORTHO Spray Sticker has proven especially beneficial in sticking nutritional sprays.

Post Bloom Spray *(from ⅔ petal fall until fruit reaches ½" in diameter)*

ORTHOCIDE 50 Wettable	**Dosage:** 10 lbs./500 gals.	**Controls:** Fruit Set, Foliage Growth, Melanose, Scab, Black Scale, Florida Red Scale, Purple Scale, Citrus Rust Mite, Fruit Russet, Citrus Red Mite, Texas Citrus Mite, Six Spotted Mite, Aphids, Mealybugs, Fruit Worms
ORTHO Parathion 8 Flow Concentrate	**Dosage:** 20 ozs./500 gals.	
ORTHO Zineb 75 Wettable	**Dosage:** 3 lbs./500 gals.	
ORTHO Trithion 4 Flowable or ORTHO Ethion 4 Flowable	**Dosage:** 40 ozs./500 gals.	
ORTHO Spray Sticker	**Dosage:** 40 ozs./500 gals.	

Note: In recent years, minor pests, including Aphids, Mealybugs, Fruit Worms, Black Scale, have become increasingly important to control. Parathion in the post bloom spray prevents the build-up of these pests. If preferred, ORTHO Malathion may be substituted.

Summer Spray *(July 1 to July 31)*

FLORIDA VOLCK Soluble Spray	**Dosage:** 5 gals./500 gals.	**Controls:** Florida Red Scale, Purple Scale, Black Scale, Citrus Red Mite, Texas Citrus Mite, White Fly, Sooty Mold, Greasy Spot, Citrus Rust Mite, Fruit Russet
ORTHO Zineb 75 Wettable	**Dosage:** 5 lbs./500 gals.	

Note: Check with your local ORTHO Fieldman for other available phytonomic oil sprays. Florida Red Scale is best controlled between July 15 and July 31. If the interval between the Post Bloom Spray and the Summer Spray is extended to an aerial application of ORTHO Trithion 4 Flowable or ORTHO Trithion – Sulfur dust formulations may be needed for control of rust mites and spider mites prior to the Summer Spray.

Fall Spray *(October 1 to November 15)*

ORTHO Tedion 25 Wettable	**Dosage:** 2½ lbs./500 gals.	**Controls:** Citrus Red Mite, Texas Citrus Mite, Citrus Rust Mite, Fruit Russet
Chlorobenzilate 25 Wettable	**Dosage:** 2½ lbs./500 gals.	
ORTHO Spray Sticker	**Dosage:** 40 ozs./500 gals.	

Note: In groves where greasy spot is a problem, protection of the late summer-early fall flush may be necessary. ORTHO PHALTAN 50 Wettable and ORTHO Copper 53 Fungicide combined with ORTHO Spray Sticker are recommended for this use. Consult your local ORTHO Fieldman for information on the proper rates and timing.

Florida growers report top results with ORTHO program

"VOLCK Soluble Oil Spray is far superior to any oil I've ever used for scale control, and ORTHOCIDE 50 Wettable has given a definite increase in fruit set," says J. Reuben Newbold of Crescent City, Florida. Top-quality products specially formulated in Orlando and all the extra benefits of ORTHO Field Service are yours when you buy the ORTHO Citrus Spray Program. That's why most Florida growers have preferred ORTHO for over 36 years.

ORTHO®

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CALIFORNIA CHEMICAL COMPANY, ORTHO DIVISION.....P.O. Box 7067, Orlando, Florida

ON ALL CHEMICALS, READ DIRECTIONS AND CAUTIONS BEFORE USE. T. M. REG. U.S. PAT. OFF.: ORTHO, VOLCK, ORTHOCIDE, PHALTAN.

27 YEARS OF CITRUS COSTS AND RETURNS IN FLORIDA — 1931-1958

(Continued from Page 21)

per acre, or eight cents per box, in 1957-58. This cost per acre varied from nothing to $74.37. There were 14 groves, or 9 percent, that received no spray or dust. Forty-two percent of the groves had such costs of less than $20 per acre, and 24 percent had such costs ranging from $5.00 to $14.99. Fifty-two percent had such costs of $25.00 or more and on 21 percent it was $40.00 or more.

State and county taxes averaged $7.55 per acre for the 27-year period, or three cents per box. The range in such costs per season was from $4.07 per acre in 1942-43 to $13.33 in 1957-58. The seasonal average was less than $6.00 in 14 seasons, or 52 percent of the seasons. The second highest season was 1955-56 at $12.74 per acre.

The range in state and county taxes per acre for 1957-58 was from $1.14 to $37.19. Sixteen percent of these groves had taxes less than $10.00 per acre, 39 percent between $10.00 and $14.99, or 55 percent less than $15.00 per acre.

Miscellaneous cost averaged 5 percent of operating costs for the 27-year period, or $5.60 per acre. This amounted to two cents per box. Variations in seasonal averages were from $0.53 per acre in 1934-35 to $21.88 in 1955-56. Miscellaneous costs include such items as overhead, trees for replacement, city taxes, drainage district assessments, and fuel for grove heating.

Returns from fruit averaged $262.33 per acre for the entire period or $1.06 per box. Seasonal averages per acre varied from $50.10 in 1932-33 to $544.94 in 1945-46. The per-box averages varied from 38 cents in 1932-33 to $2.02 in 1944-45. Returns from fruit amounted to $136.41 per acre in 1947-48, the lowest since 1940-41. However, there were eight of the 27 seasons with lower returns per acre.

The price received for fruit in 1947-48 was 43 cents per box, the third lowest of these seasons. There were 14 seasons in which the per-acre returns were less than the average for the period and there were 17 seasons in which the per-box returns were less than the average. Fruit returns were $391.03 per acre in 1948-49, an increase of 187 percent over the previous season.

Another increase of 26 percent in 1949-50 brought fruit returns to $493.02 per acre, which was the fourth highest of the 27 seasons. Likewise the returns per box showed an increase and was 43 cents in 1947-48, $1.14 in 1948-49, and $1.96 in 1949-50. The latter price is 4.6 times that for 1947-48. The price dropped to $1.14 in 1950-51 and 67 cents in 1951-52. The price for all fruit was $1.89 in 1957-58.

Yield and price determine the per-acre returns from fruit. High yields and high fruit prices resulted in pyramided returns per acre during the 13 seasons of 1942-46, 1948-51, and 1952-58, so much so, that the average of the 27 seasons was above any of the other 14 seasons. Average returns per acre for these 13 seasons was 4.1 times the average for the first ten years of these records.

There were five groves in 1957-58, 3 percent, that had returns from fruit less than $100 per acre, and 22 groves, 14 percent, with returns from fruit less than $200 per acre. Fifty-four percent of the groves had from $200 to $599 returns from fruit per acre. The range was from $11.72 to $1688.08 per acre, and the average was $494.49.

The average on tree price received in 1957-58 was $1.89 per box. The range in price was from 42 cents to $4.20 per box. Twenty-four percent of the groves had an average fruit price of less than $1.40 and 66 percent received less than $2.00 per box. The price received varied with a number of factors including kind and variety of fruit, whether processed or sold fresh, managerial salesmanship, internal and external fruit quality, fruit size and total volume produced.

Returns above operating costs dropped from $407.33 per acre in 1945-46 to $56.09 the following season, a drop of 86 percent. Yet there were eight of the 26 seasons of these records that averaged lower returns above operating costs than in 1946-47. There were nine seasons, 1942-46,

MORTON RESIGNS FROM WAVERLY

J. C. Morton, one of the state's best known and most active citrus factors, has announced his resignation as superintendent and first vice president of Waverly Citrus Growers Cooperative effective April 1.

Morton has been associated with the Waverly organization since 1938. He played a prominent part in the organization of the Florida Clearing House Association and was a leading figure in the later organization of Florida Citrus Mutual. An addition to the Mutual headquarters building in Lakeland was named for Morton just a few weeks ago.

1948-51, 1952-53 and 1957-58 with income above operating costs exceeding the average for all seasons. There were 10 seasons that had income above operating costs per box higher than the 58-cent average.

There were two seasons, 1932-33 and 1947-48, when operating costs exceeded returns from fruit. The returns above operating costs per acre ranged from –$21.97 in 1947-48 to $425.07 in 1943-44 and averaged $144.36. There were 13 seasons, 48 percent, when returns above operating costs were less than $100 per acre and 13 seasons, 48 percent, when less than 40 cents per box.

There was considerable difference between the average returns above operating costs per acre for the first 10 seasons, $40.07, and for the remaining 17 seasons, $205.62. The latter figure is five times the former. Average returns above operating costs per box for the latter period was 270 percent of the former period (73 and 27 cents, respectively). There was one season in each period with negative returns above operating costs.

Returns above operating costs were the lowest in 1947-48 of the 27 seasons, when the returns from fruit lacked $21.97 of paying operating costs. On a per-box basis, the loss was seven cents. During this season there were 141 groves, 65 percent, on which the fruit did not return operating costs. However, the following season,

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The LYONIZER

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Reports Of Our Field Men . . .

HIGHLANDS AND POLK COUNTIES

R. E. Lassiter, Jr. & J. E. Rubush
P. O. Box 1304
Winter Haven, Fla.

After some growers had started irrigating we experienced some very good rains which have totaled approximately 3 to 4 inches up until the time of this writing. Since this spring started off a little on the dry side and the spring growth came ahead of the rains, we have not had any troubles with melanose as yet.

Most growers have applied the first application of fertilizer to their young trees. This fertilization should be continued every six weeks during the summer growing season.

The growth on the citrus trees has been excellent this spring. Heavy winds during the past few weeks hurt some of this growth on the west sides of the older trees. Young trees were hurt quite a bit from the sand blasting especially where there was little grass or cover on the ground.

The application of post-bloom sprays has started. These sprays should be applied when 2/3 of the petals have fallen from the blossoms. If nutritional sprays have not already been applied and are needed they should be added to this post bloom spray. We are noticing quite a few rust mite at this time, however, the aphids and six-spotted mites are at a minimum this spring. Where scale are present a scalicide should be added to the post bloom spray.

WEST HILLSBOROUGH, PASCO AND PINELLAS COUNTIES

Calvin P. Lloyd, III
Tampa, Fla.

The rain that we had in this area (March 13th) sure did help all of our citrus growers. Some of the growers had already started to irrigate, but were glad to put up the pipe. The weather for bloom this year has been very good, and the growers all have a good flush of growth.

The top dresser has already been applied in most of the groves and the ones that applied the fertilizer early are already witnessing the results of it. The banks are all down from the young trees, and except for a little sand blasting that they experienced in open fields when the wind really blew, look real good. These young trees should be fertilized every four to six weeks to keep them in a succulent growing state all through the summer.

As for our mites and insects, the rust mites are at a high level in some groves, and the red spiders are hanging on for a long time. There are a few groves that show some red scale, but they are very few.

SOUTH HILLSBOROUGH, MANATEE AND SARASOTA COUNTIES

R. C. Revels, Jr.
P. O. Box 3332, Apollo Beach, Fla.

Strong wind and sand storms followed by frost and a six inch rain brought some damage to the crops in this area. The sand and rain did more damage than the frost. It is hard to determine just how much the farmers have lost. Most estimates place damage at 20 to 25 per cent. Tomatos had already started setting the first hand and small tomatoes were evident throughout the fields. Most of this first hand will be a total loss. The rain damage was confined to the Ruskin area. All other sections escaped with just enough rain to put a good season in the ground. Further inland the frost caused some damage to pepper and potatoes.

Most citrus groves received just the right amount of rain. They were getting pretty dry and some growers had already started watering.

All groves have good bloom with the exception of pineapples, which seems to be light all over the state. It will be time for a post-bloom spray in a week or so, or just as soon as two-thirds of the petals have fallen. A recommended formula of Copper, Manganese, Zinc, Sulphur or Chlorobenzilate. This will control melanose, scab, greasy spot and rust mites. If spider mites are evident, Trithion or Kelthane can be used instead of Chlorobenzilate or Sulphur. Use of Zineb with copper doesn't seem to give the needed control on rust mites, so some other material is recommended.

NORTH CENTRAL FLORIDA

V. E. Bourland
Winter Garden, Fla.
Phone 107

We have had typical March weather up to date, with high wind and sand storms, also cold with frost combination got beans, squash, and pepper, also melons.

Groves have a heavy bloom and new growth which was burned by cold wind and sand, but no great damage. Mid-season fruit is about all picked, Valencias not ready for picking, some packing houses are planning on closing down two to three weeks or longer to allow Valencias to mature.

Young trees have been unbanked and fertilized, and seem to be in prime condition. Some growers are irrigating, and some spray machines going. We had about half an inch of rain Monday night (March 13).

SOUTH POLK, HIGHLANDS, HARDEE AND DeSOTO COUNTIES

C. R. Wingfield
Phone: Glendale 3-4537
Avon Park, Fla.

March 9, 10 and 11th were quite a blow to vegetable growers through this section of the state. First winds at better than 40 mph which moved the dry sands at approximately the same speed. This sand blasted all vegetable crops above ground. Then on the 11th temperatures dropped below freezing and left us with a heavy frost that just about finished the deal. There will, however, be some crops left. The Everglades section was heavily damaged by the frost. The shortage of crops should give us better prices.

Citrus was not hurt anything like the vegetables but the wind and sand did burn a lot of foliage and some possible damage to bloom, depending on the state of bloom. After the wind and cold we had a rain than ranged up to 3 inches. Had the order been reversed our damage would have been lighter.

27 YEARS OF CITRUS COSTS AND RETURNS IN FLORIDA — 1931-1958

(Continued from Page 25)

1948-49, only five groves, 2.5 percent, failed to return operating costs.

In the 1957-58 season 26 percent of failed to return operating costs and in 1957-58, 15 groves or 9 percent. There has not been a season of these 27 when all groves returned operating costs. One or more groves were in the red in each season. Twenty-six percent of these groves returned less than $100 per acre above operating costs and 56 percent less than $100 per acre above operating costs and 56 percent less than $300 in 1957-58.

In he 1957-58 season 26 percent of these groves returned less than 50 cents per box above operating costs and 54 percent less than $1.00. The variation was from a loss of $4.64 per box to a net of $3.12 and returns above operating costs averaged $1.06 per box.

At the rate of returns above operating costs in 1946-47, 75 acres of grove would be necessary to return $4,200 to the owner for interest on the grove investment, interest on borrowed money, his own supervision and profit. However, at the 1948-49 rate of returns above operating costs, only 17 acres would be required for a return of $4,200; in 1949-50, 12 acres; in 1950-51, 17 acres; in 1951-52, 69 acres; in 1952-53, 27 acres; in 1953-54, 30 acres; in 1954-55, 37 acres; and 1957-58, 16 acres.

There were eight of these 27 seasons when returns above operating costs were lower per acre than in 1946-47 and 20 when they were lower than 1948-49. The averages for these two groups were 18.21 and $75.73 per acre, respectively. At $18.21 per acre returns above operating costs, 231 acres would be necessary to net $4,200 while 56 acres would be necessary at the rate of $75.73 per acre, and 30 acres at the 27-year average of $144.36.

Interest on grove valuation has been figured at 6 percent since the inception of this project. Each cooperator was asked for his estimate of the valuation of his grove when considered as a long-time fruit-growing enterprise. The results were that conservative figures were given and there has been a reluctance on the part of the cooperator to change his valuation even after a substantial change in fruit prices and grove sale prices. Interest on grove valuation by seasons varied from $28.87 per acre in 1940-41 to $68.01 in 1957-58. The average was $42.94 for the 27 seasons. Interest per box varied from 10 cents in 1943-44 to 40 cents in 1933-34 and averaged 17 cents.

Total cost without owner supervision is made up of five items included as operating costs plus the item of interest on estimated grove valuation. This item of interest added 36 percent to the operating costs on the average. Another way of stating the same thing is that on the average the total cost without owner supervision was 36 percent higher than the operating costs.

This increase varied from 23 percent in 1945-46 to 80 percent in 1934-35 and did not amount to less than 47 percent until the 1942-43 season. During the six seasons of 1944-50, this increase in interest charged amounted to 30 percent or less. In 1950-51 and 1952-53 interest on the grove valuation was 36 percent, and 35 percent of the operating cost in 1951-52. Interest was highest in 1957-58 at $68.01 per acre but was only 31 percent of the operating cost.

The distribution of cost per acre with owner supervision omitted for the 1957-58 season averaged $286.08. Six percent of the groves had such costs of less than $175 and 36 percent with less that $250. All groves averaged $1.09 per box in 1957-58 with one out of 16 having such costs of less than 50 cents and 31 percent with less than 80 cents. Fifty-six percent of these groves had such costs of $1.00 or more.

Net returns in this study mean the amount left to the grower of his returns from fruit after paying operating costs and interest on the grove valuation. It is the amount left for owner supervision and profit. There were six of the 27 seasons when returns from fruit failed to pay total cost without owner supervision and another season, 1951-52, broke even. There were two of these seasons when operation costs were more than returns from fruit.

Net returns per acre ranged from –$61.76 in 1947-48 to $395.18 in 1943-44, and averaged $101.42. The first five years of these records, 1931-36, averaged –$1.70 per acre for net returns. The 1936-41 period averaged $13.39; 1941-46, $291.95; 1946-51, $138.25; and 1951-56, $53.75 per acre. There were 14 seasons, 52 percent, with average net returns of less than $50 per acre. There were 15 seasons, 56 percent, with net returns of less than 20 cents per box, and four seasons had net returns of $1.30 or more per box. The average was 41 cents per box with

only nine of the 27 seasons exceeding this amount.

In 1957-58 the net returns after figuring interest on grove investment was $208.40 per acre. Twenty-two percent of the groves that season did not have sufficient income to pay all costs. Thirty-six percent of these groves had net returns of less than $100 per acre and 64 percent with less than $300. Twenty-nine percent of these groves had net returns per box of less than 25 cents in 1957-58 and 56 percent with less than 75 cents.

EFFECTS OF PROMOTION ON ORANGE CONCENTRATE SALES ANALYZED

A $4-million nationwide promotional campaign for frozen orange concentrate increased sales sufficiently to bring the industry an estimated additional $18 million in gross income which it probably would not have received otherwise, according to a marketing research report issued recently by the U.S. Department of Agriculture.

From September 1959 through March 1960 the dollar sales volume was 13 percent above the level that normally would be expected at the prevailing prices.

This study showed that the sales increases were obtained from two sources. The percentage of the Nation's families buying the product increased along with an increase in the average size of family purchase, compared with periods of no promotion.

The study was made to measure the effects of a campaign to market an unusually heavy supply of orange concentrate that threatened to depress prices below levels that would provide a reasonable return to processors and distributors, and to fruit growers in the next crop year. The promotion was financed by producers of frozen orange concentrate and was conducted with the cooperation of the Florida Citrus Commission.

This promotional campaign was carried on in September-November 1959. During that period, sales were substantially above levels that would normally be expected, and they remained at a higher level than normal for several additional months.

The study is part of a national research program of USDA's Agricultural Marketing Service to improve marketing and sales efficiency and expand markets for farm products.

A copy of the report, "Effectiveness of a Special Promotional Campaign for Frozen Concentrated Orange Juice, Marketing Research Report No. 457, may be obtained from the Marketing Information Division, Agricultural Marketing Service, U.S. Department of Agriculture, Washington 25, D. C.

FARM FIRE LOSSES IN 1960 DROP SLIGHTLY

Farm fires caused losses estimated at $165 million during 1960, the U. S. Department of Agriculture reports. This is about 5 percent less than the estimated 1959 loss of $174 million, the highest on record.

Economists of USDA's Agricultural Research Service based their 1960 estimate on reports received from 207 farmers' mutual fire insurance companies, selected from 1,625 such firms insuring farm risks.

Building losses were about 65 percent of total loss payments by companies for which a breakdown by property class was available. Almost three-fourths of the building losses were on main buildings—dwellings and barns.

FROZEN ORANGE CONCENTRATE BEST 10-YEAR SELLER

The Florida Citrus Commission officially has confirmed what had been suspected for some time that frozen orange concentrate is the hottest selling item in frozen food cabinets of the nation's stores — and has been during the past 10 years.

In a 29-page report just released, Dr. W. E. Black, Commission marketing specialist, analyzed sales of various citrus products for the past decade and concluded that frozen orange concentrate purchases by consumers increased 229 per cent while other frozen concentrated juice purchases jumped only 142 per cent. He said all purchases of frozen concentrated juices increased 217 per cent for the period.

A comparative newcomer — chilled orange juice — could not be traced back 10 years because it was only introduced on a large scale during the middle 50's. However, Dr. Black concluded that it met with "good consumer acceptance" and 1960 purchases of the product "were equal to one-tenth of frozen cocnentrate volume, on a single strength basis."

Fresh grapefruit consumption, he found, remained relatively steady which should add to a bright marketing future.

Canned citrus juice purchases were down during the 10-year period. Canned single strength orange juice dropped 57 per cent and canned single strength grapefruit juice dropped 49 per cent.

"In comparison, the volume of all kinds of canned single strength juices purchased in American homes dropped only 30 per cent, which means that the share of the market for orange and grapefruit canned single strength juices declined in the last 10 years," he said.

GRIFFIN ELECTED TO BOARD OF ALICO

Ben Hill Griffin, Jr., a prominent Florida citrus producer and processor, rancher and timberland owner, has been elected to the board of directors of ALICO Land Development Co.

Alico owns some 236,000 acres of land in Central and South Florida which is being developed and used primarily for the production of citrus, cattle, timber and leasing for farming and pasturage purposes.

Griffin is president of Griffin Industries, Inc., subsidiaries of which operate a citrus concentrate plant and a fertilizer plant in Frostproof, Fla., and a single strength citrus juice and citrus section plant at Bartow, Fla. He is also president of the Citrus and Chemical Bank of Bartow.

The 50-year old Florida business and civic leader is serving his third term in the Florida State Legislature as Representative from Polk County.

New ideas on freezing were demonstrated before all Marion County home demonstration clubs recently by Miss Elsie Garrett, home demonstration agent.

Classified Ads

Buyer's-eye view of S-P-M citrus quality

Slice a Sul-Po-Mag grown orange. See the thin rind . . . the bright color . . . the high juice output — from a season-long supply of water-soluble Sul-Po-Mag.

better color...thinner rind...more vitamins in the juice

That's what buyers see in samples picked from trees nourished by Sul-Po-Mag. Citrus trees "like" what they get from Sul-Po-Mag — water-soluble magnesium that produces fruit of exceptionally good quality. Tests prove that, with adequate magnesium, rinds *are* thinner . . . color is brighter (inside and out) . . . and sugar and vitamin content of the juice are greatly increased. With Sul-Po-Mag, yields are greater too. Water-soluble Sul-Po-Mag stays in grove soils all season long . . . slowly releases magnesium nutrition for better tree health and higher fruit quality. Next time you buy fertilizer, ask for Sul-Po-Mag.

S-P-M PREMIUM

Quality fertilizer containing a combination of readily available magnesium and sulphate of potash obtained from Sul-Po-Mag®

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